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From biodiversity to bioperversity: from good science to poor environmental policy

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Abstract

While Australia is one of the world leaders in conservation biology, it is not in conservation policy. Proposed so-called policy "reforms" in environmental policy will undermine many of the important gains made in conservation management. Here I outline four retrogressive policy changes proposed or currently taking place in eastern Australian states. These range from branding climate research as "post-normal" science through to grazing of alpine environments to reduce "blazing" despite overwhelming evidence that it has no such effects. Conservation scientists will need to work extremely hard to communicate their science and underscore the need for scientific data to underpin truly evidence-based conservation policy and evidence-based conservation management. The consequences of failing to do so will be impaired environmental and conservation outcomes and an ongoing decline in the quality of environmental policies.

Introduction

I first met Ivor Beatty in 1983 at a conference on arboreal marsupials in Armidale, northern New South Wales. Through his firm, Surrey Beatty & Sons, Ivor published the classic edited volume from that meeting that brought together the state of knowledge of arboreal marsupials in Australia at that time (Smith and Hume 1984). This book remains an important reference text almost three decades after it was published. Ivor Beatty played pivotal roles in developing the scientific field of conservation biology in Australia, for example, through publishing a series of edited volumes on landscape change and habitat fragmentation led by Denis Saunders and his colleagues from CSIRO in Western Australia (Saunders *et al.* 1987, Saunders and Hobbs 1991, Saunders *et al.* 1993). These books are classics and brought together a coherent body of high quality research to advance the science and practice of conservation.

But what might Ivor Beatty think about where we are at now? There can be no doubt that the science of conservation biology has developed enormously in Australia over the past few decades. Some eminent scientists (e.g., Paul Ehrlich) claim that some of the best conservation biology research in the world takes place in Australia (see also {Harrison, 2006 #37}). It is clear to me that, through his role as a publisher, Ivor Beatty played a significant role in Australia attaining a leading role in fostering and developing conservation science. However, I would argue that advancements in the science are not congruent with new and often quite regressive conservation and environmental management policies in some parts of Australia. That is, recent policies do not reflect the science and in many cases undermine it, leading to what I term "bioperversity". Here I will present four examples that illustrate the potential dangers of the current situation which threatens to shift "biodiversity to bioperversity". In some cases I use traditional references to support these examples. In others, I was privy to conversations with senior biocrats and I am not able to provide traditional supporting references. Finally, I outline some suggestions for what I think needs to be done to avoid bioperversity.

Examples of "bioperverse" policies

The past two to three years has seen a series of markedly anti-environment policies being developed in Australia. This has occurred in all three mainland states of eastern Australia. A small subset of these is set out below. They are just some of many that could have been included.

Domestic livestock grazing in the Victoria high country

Domestic livestock grazing was widespread in Australian alpine regions following settlement by Europeans. Concern over the effects of grazing began to be raised in the 1890s (Good 1992) and scientific studies to address these concerns commenced after the Second World War. Several long-term studies subsequently revealed that livestock grazing reduces

vegetation cover, increases the amount of bare ground, and increases soil loss {Costin, 1954 #38}{Williams, 2006 #25}. he negative effects of grazing can be reversed following the cessation of grazing, although recovery is slow. Conversely, no studies over the past 50 years have identified any environmental benefits of grazing by domestic livestock. Notably, in Victoria, livestock grazing is formally listed as a potentially threatening process under the *Flora and Fauna Guarantee Act 1988* (Department of Sustainability and Environment 2012).

There also have been suggestions that grazing can reduce the risk of fire in alpine ecosystems; *viz*: 'alpine grazing reduces blazing' (House of Representatives Select Committee into the Recent Australian Bushfires 2003). However, {Williams, 2006 #25} demonstrated that livestock grazing has no significant fire mitigation effects in alpine ecosystems.

Despite scientific strong evidence of the significant negative environmental effects of livestock grazing, the lack of scientific evidence for any environmental benefits and the lack of evidence that fire risks are reduced by livestock grazing, the Government of Victoria has nevertheless proposed to conduct a "trial" grazing study in the high-country of that State (Department of Sustainability and Environment 2011).

Ill-informed policies to re-introduce grazing in Australian alpine regions would lead to a number of negative environmental outcomes including increased soil erosion, increased pressure on threatened biota and communities already under stress from other factors (such as climate change), and altered vegetation structure and possibly associated changes in fire regimes (R. Williams, personal communication).

Clearing of native vegetation in Victoria and New South Wales

The importance of native vegetation for the persistence of native biota in agricultural landscapes has been well known for many decades, both worldwide (reviewed by (Tscharntke *et al.* 2012) and in Australia (Saunders *et al.* 1987, Fischer *et al.* 2010). The

array of ecological roles played by individual paddock trees is also increasingly well known (e.g., (Gibbons and Boak 2002, Maron and Fitzsimons 2007); reviewed by (Manning *et al.* 2006)). Finally, the value of replanted areas for many elements of farmland biota, including a number of bird species of conservation concern, has been demonstrated in a suite of studies ((Lindenmayer *et al.* 2010); reviewed by (Munro *et al.* 2007)).

The rapidly expanding body of knowledge on the ecological and conservation values of remnant native and replanted vegetation in agricultural areas is not reflected by proposed "reforms" to legislation on native vegetation. Proposed changes will facilitate the clearing of paddock trees and even the clearing of replantings on farms in Victoria (Victorian Farmers Federation 2011) and New South Wales. For example, in New South Wales, a policy position that allows more land manager flexibility and control over native vegetation may be adopted. Currently, the NSW Government is undertaking a review of the regulations for the *Native Vegetation Act 2003*. According to the Government, the aim of this review is to better:

- empower the farming community to protect the environment and manage farms sustainably, and
- maintain the environmental standard set by the *Native Vegetation Act 2003* (NSW Department of Environment and Heritage 2012).

In reality, these "reforms" are likely to lead to large losses in populations of scattered paddock trees and small remnants of native vegetation to allow land managers more opportunity to take advantage of seasonal conditions, save time and save money. Unfortunately, this cannot be achieved without significant environmental impacts, despite the fact that the New South Wales Government suggests otherwise. The environmental implications of altered legislation will include the return to well-known detrimental practices such as land clearing and overstocking that promote land degradation. These will not only

accelerate the loss of biodiversity, but ultimately also undermine the productivity of paddocks and farms; the antithesis of ecologically sustainable farm management.

Climate science as "post-normal" science in Queensland schools

Extensive scientific information has been assembled around the world on rapid changes in climate and its impacts on the environment. There are literally thousands of scientific articles published annually on this topic. Leading scientific publishers such as those responsible for publishing *Nature* now even have an entire journal dedicated to the science of climate change. There are likewise detailed reviews of climate change and its likely impacts on biodiversity and on the environment in Australia (e.g., (Steffen *et al.* 2009)). Yet, at a convention of Liberal National Party (the present state government) politicians in Queensland in mid-2012, a motion was carried to preclude the teaching of climate science in schools. The rationale behind this motion was that climate science was "post-normal" science and was inappropriate for inclusion in school curricula (see (Morton and Hurst 2012, Readfearn 2012).

Irrational and anti-scientific perspectives and policies on climate change may either delay action, lead to ineffective actions, or both. This will have the effect of making efforts to tackle these problems more expensive and far more difficult (if they are resolvable at all).

Post-fire logging in Victorian wet forests

The 2009 wildfires in Victoria were the most destructive in Australian history in terms of the loss of human life and damage to property (Gibbons *et al.* 2012). In the case of the tall, wet ash-type forests of the Central Highlands of Victoria, in which I have worked for almost three decades, significant areas of forest were burned. For example, ~72 000 ha of ~161 000 ha of Mountain Ash (*Eucalyptus regnans*) forest was burned in 2009. The area of remaining old growth Mountain Ash forest is calculated at 1866 ha or 1.16% of the total Mountain Ash forest estate (Lindenmayer *et al.* 2012). Moreover, this area of old growth is

highly fragmented and disjunct, distributed across 147 separate patches. Extreme rarity of old growth has arisen because of a 45-year history of recurrent, high-intensity clearcut logging, ongoing clearcut logging, as well as repeated major wildfires including those in 1905, 1926, 1932, 1939, 1983 and 2009, and widespread salvage logging following the 1939, 1983 and 2009 wildfires (Lindenmayer *et al.* 2012). The paucity of old growth, coupled with the rapid loss (but very limited recruitment) of large old hollow-bearing trees in Mountain Ash forest (Lindenmayer *et al.* 2012) means that many species of cavity-dependent animals will be on an extinction trajectory in this ecosystem. This includes the nationally endangered Leadbeater's Possum (*Gymnobelideus leadbeateri*) whose distribution is strongly associated with large old trees within ash-type eucalypt forests (Lindenmayer 2009).

Despite the losses of Mountain Ash forests following the 2009 wildfires, the limited remaining areas of old growth forest, and the likely extinction trajectory for Leadbeater's Possum, there has been no attempt by the Victorian Government to revise sustained yields of pulpwood and timber from Mountain Ash forests (Lindenmayer *et al.* 2012). This means that the rate of cutting of the smaller remaining areas of unburned "green" forest has actually increased. It is not possible to claim that these problems are unknown or poorly understood. The status of Mountain Ash forests following the 2009 wildfires is well documented as is the biology and ecology of the organisms of conservation concern inhabiting those forests. Moreover, the radical changes in the forest age structure in Mountain Ash forests means that stands of trees old enough to be sawlogs may well be exhausted within the coming 10-15 years, leading to the possible "extinction" of the sawlog industry in the Central Highlands region. Despite this, the policy position of the Victorian Government is set to "lock in" 20-year guaranteed wood supplies to the forest industry (Victorian Department of Primary Industries 2011) even though there may be insufficient timber resources to do this. Hence, as

in the other examples in this section, policy and management do not match either the conservation science or the resource (i.e., wood supply) science.

The likely result of "locking in" pulpwood and timber supplies will be to lock in the extinction of iconic species such as Leadbeater's Possum, lock in the extinction of the sawlog sector of the forest industry, and compromise other "new century industries" such as managing native forests as carbon stores. Organisations in Victoria like VicForests that are responsible for providing "feedstock" to the pulpwood and timber industries have lost large amounts of money on an almost annual basis for the past decade. Guaranteeing supplies from already overcommitted forests appears certain to increase the losses incurred by the Victorian Government.

Notably, in a media statement on 18 September 2012, Ryan Smith, the Victorian Minister for the Environment, stated that the Victorian Government is committed to the protection of all of the State's flora and fauna (Bush Telegraph interview). However, the Minister was not confident that species such as Leadbeater's Possum would survive in the wild. His "confidence" implies that the survival of the species may be dependent on captive breeding programs. However, there has been no records of the species breeding successfully in captivity for more than a decade and even if there was, there is arguably a moral issue of creating captive populations if there is no suitable habitat in which to release them. I would argue that the time to make successful species management interventions is when wild populations are extant at "reasonable" numbers such as in the current case for Leadbeater's Possum. It should not be when species reach a critical point when crisis management is often expensive and has a high risk of failure.

What can be done to avoid bioperversity?

The examples in the preceding section are a small subset of the policies reflecting an anti-environment (and often a distinct anti-science) approach developing among some

Australia governments. I have not mentioned in detail others like the Victorian Government's ludicrous suggestions that riparian vegetation should be removed to prevent flooding (Pittock 2012) and funds should be expended to find large felid cats such as pumas and panthers in that State (McLennan 2012).

The science associated with each of the issues outlined above is clear and widely communicated. Yet this is not reflected in appropriate policies. There is some pedigree to this problem in Australia. For example, {Beresford, 2004 #39} outlined a number of (flawed) historical perspectives on salinity, land clearing and cropping in Western Australia. The book contains many extraordinary quotes about warnings of the risks of salinity including those from a Royal Commission in 1917 suggesting that: "….*scientific prejudice against our mallee lands be not permitted to stand in the way of their being opened up*...." Of course, the extensive environmental, agronomic and economic problems associated with widespread salinity in over-cleared cropping lands in Western Australia are now well known {Beresford, 2004 #39}.

Given the above historical commentary on salinity together the four recent examples of anti-environment policy a key question is: What can be done to avoid bioperversity? In the remainder of this paper, I suggest three key strategies that might help address the current "policy deficits".

Continue to do good science and communicate that science

First, we must continue to do good science. In our communication of that good science, we must be aware of the limits of inference and ensure that we do not extrapolate beyond the results. This drives at the heart of maintaining scientific credibility – while the credibility of our political masters may come and go.

The core of science and knowledge is evidence. Evidence is also the basis of recent mantras in policy and management. That is, calls for evidence-based management and

evidence-based policy (Sutherland *et al.* 2004). Yet, none of the examples in the preceding section reflect the scientific evidence. I argue that governments and policy makers must be held to account for ideology-driven policy and management so that it can be replaced with evidence-based management and evidence-based policy. This suggestion resonates with those of others such as the former head of the Treasury, Dr Ken Henry, who has argued that:

> *"I can't remember a time in the last 25 years when the quality of public policy debate has been as bad as it is right now".* (Giggacher 2012)

In re-affirming that evidence is the basis of conservation and environmental science, I suggest that it is important to communicate more vocally and widely how conservation science is actually done {Wills, 1998 #35} {Olson, 2009 #36}. That is, underscoring the principles of sound experimental design, careful field data collection, rigorous statistical analysis, and robust peer review of written material. We also must communicate that the scientific methods used in conservation science are actually the same as those employed in other disciplines that (currently) have very wide public acceptance and support (like physics, chemistry and medical research).

Communicate good or successful conservation outcomes when and where they occur.

I suggest that a second antidote to the rash of anti-environment policies might be to include more commentary on successful conservation programs (Garnett and Lindenmayer 2011). This is needed for at least two key reasons. First, we need to highlight to politicians and the general public that well targeted and scientifically-based investments in conservation **can** work and produce good environmental outcomes. Evidence of success in revegetation programs in temperate eucalypt woodlands (Lindenmayer *et al.* 2010) is but one of several examples (Garnett and Lindenmayer 2011). Second, we need to provide clear guidance for policy makers and resource managers on what is needed to achieve successes in conservation (Garnett and Lindenmayer 2011).

Forge more science-policy maker partnerships

The best progress on many conservation problems is often made when joint projects are established that are based on partnerships between scientists, policy makers, and resource managers (Gibbons *et al.* 2008). In this author's experience, these partnerships work well when: **(1)** the partnership members are science-literature policy makers and policy-literate scientists, **(2)** there is mutual appreciation of the fact that the different groups of professionals in a partnership have different reward systems and different job demands, and **(3)** there are extensive opportunities to mutually discuss and resolve conjoint policy and scientific problems (Lindenmayer *et al.* 2011).

Of course, even with the best of intentions, these kinds of partnerships are very difficult to maintain when policy-makers are provided with illogical, scientifically-flawed and environmentally-bankrupt directives from politicians, such as those which feature in the above examples.

Think about the real drivers

Ultimately, conservation biologists need to prosecute the case on why humanity is facing a myriad of environmental problems better (and far more forcefully) – and why we seem to be inept at truly tackling them. The answer is of course humanity itself – the number of humans and increasing levels of consumption by humans. This issue is blindingly obvious to almost all of us, yet it is almost impossible to stimulate debate about it. Real political leadership is needed on Australian population policies; and conservation biologists must bring to bear as much pressure as possible to make our leaders debate these issues. The consequences of not doing this are quite clear. Paraphrasing a colleague (Dr. S. McIntyre): *"A thousand years from now, the legacy of humanity will be a thin smear of plastic in the stratigraphy"*

Concluding comments

I am sure that Ivor Beatty would have been pleased to see the science of conservation and environmental management continuing to strengthen in Australia. But I think he would be mortified to see that the practice of anti-environmental policy-making in some jurisdictions. I predict a tough decade ahead with many attacks aimed at undermining the environmental gains made over the past 20 years. As conservation scientists, we will have to work hard not to see a resulting rapid erosion of environmental conditions in Australia and indeed also erosion in the political and public perception of the discipline of conservation biology itself.

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